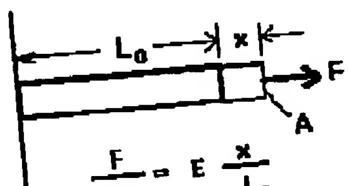
SIMPLE HARMONIC MOTION

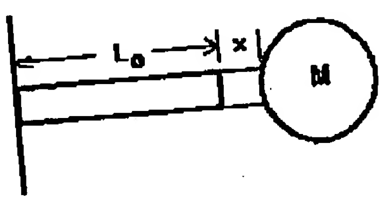
Stress $\sim$ Strain

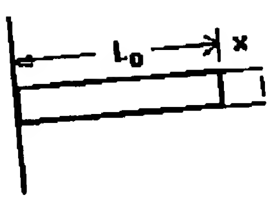
Stretch Stress	$\frac{F_\perp}{A}$	$=$	**E**	**Stretch Strain**	$\frac{\Delta L}{L}$
Shear Stress	$\frac{F_\parallel}{A}$	$=$	**G**	**Shear Strain**	$\frac{\Delta x}{L}$
Bulk Stress	$\frac{F}{A}=P$	$=$	**B**	**Bulk Strain**	$\frac{\Delta V}{V}$

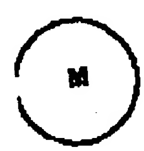


$$\frac{F}{A} = E\,\frac{x}{L_0}$$

$$F = \frac{AE}{L_0}\,x \qquad F = k\,x$$







$$-F = ma$$

$$F = kx$$

$$-kx = ma$$

$$a = -\frac{k}{m}x(t)$$

$$x(t) = x_0 \cos\left(\sqrt{\frac{k}{m}}\, t\right) + \frac{v_0}{\sqrt{\frac{k}{m}}} \sin\left(\sqrt{\frac{k}{m}}\, t\right)$$

$$v(t) = v_0 \cos\left(\sqrt{\frac{k}{m}}\, t\right) - x_0\sqrt{\frac{k}{m}} \sin\left(\sqrt{\frac{k}{m}}\, t\right)$$

$$a(t) = -\frac{k}{m} x(t)$$

$$\sqrt{\frac{k}{m}} = 2\pi f = \frac{2\pi}{T} = \omega$$

Spring Potential Energy $= \frac{1}{2}kx^2$

Kinetic Energy $= \frac{1}{2}mv^2$

Energy $= SPE + KE = \frac{1}{2}kx^2 + \frac{1}{2}mv^2 =$ **CONSTANT E**

$$E = \frac{1}{2}kx_0^2 + \frac{1}{2}mv_0^2$$

$$E = \frac{1}{2}kx_{max}^2 + 0$$

$$E = 0 + \frac{1}{2}mv_{max}^2$$

$$E = \frac{1}{2}kx(t)^2 + \frac{1}{2}mv(t)^2$$